National Park Service

National Park Service
U.S. Department of the Interior

Inventory And Monitoring Program

Cape Cod National Seashore

Digital Image Management Guidelines (Draft)

Version: 2004

Developed by:

Velma Potash
Cape Cod National Seashore

I. Purpose

1. Define digital image assets and their recommended formats.
2. Describe the local file storage structure and procedures.
3. Define the minimum metadata attributes and cataloging procedures.
4. Describe procedures and locations for archiving and distribution of image files

II. Reference Documents and Acronyms

Documents

1. Cape Cod National Seashore Natural Resources Data Management Plan (TBD)
2. Cape Cod National Seashore ThumbsPlus Users Guide
3. Cape Cod National Seashore Guidelines for Taking Digital Photos (TBD)

Acronyms

GIS	Geographic Information System
GPS	Global Positioning System
I&M	Inventory & Monitoring (Program)
NPS	National Park Service
NR	Natural Resources (Division)
CACO	Cape Cod National Seashore
METS	Metadata Encoding and Transmission Standard
DC	Dublin Core Metadata Standard
TSN	Taxanomic Serial Number
ITIS	Integrated Taxonomic Information System

III. Bibliographic Citation and Revision History

Recommended Citation:
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IV. Introduction

The Natural Resources Division of Cape Cod National Seashore has a large and rapidly growing collection of digital images. The collection includes high resolution aerial photographs, scanned images of historically important maps and drawings, wildlife and vegetation species vouchers, vegetation cover, and beautiful scenic pictures. Many monitoring protocols within the Inventory and Monitoring Program use photographic images and maps as an integral part of the protocol data set. All of these digital image files are important assets of the Park. The volume and importance of these files has warranted the establishment of formal procedures for processing, cataloguing, storing, and distributing these assets.

This document describes the physical and logical structure for the storage of our digital image assets. Recommended file formats and resolution are based on standards being developed for the National Park Service NPFocus image management program and the standards adopted by the Southwest Alaska Network. Archival standards recommended by the Library of Congress and the American Society for Archivists for digital assets were also considered. The document describes the general procedures that should be followed from the time an image is created until it is stored on the CACO Network. These procedures include unloading the file, renaming, editing, documenting, and archiving the files.

Distribution policies, software, storage media and acquisition technologies are changing rapidly. Revisions to this document will be frequent while the image management infrastructure develops.

V. Collections

Image files are stored in collections. Collections are logical groupings of files and their corresponding physical structure on network drives or permanent storage media like DVD's. Image Collections may be formed for a department, a program, a photographer or a benefactor. Collections may also be assembled for distribution of files to wider audiences. Collections will always be changing over time. The natural resources group has defined the following collections at this time:

Inventory and Monitoring Program Image Files

Thousands of photographs will be taken as part of the inventory and monitoring program to document sites, procedures, and findings. These photographs and drawings are an integral part of data set for the monitoring protocols. These photographs and maps require more extensive metadata than other images. These images may also be linked to monitoring databases. The images will be copied periodically and moved to public sites for distribution with the rest of the monitoring data.

Wildlife and Vegetation Image Collections

Cape Cod National Seashore has an extensive herbarium used as reference in plant identification throughout the park. The Park also has species vouchers for many animal species and plant species. All of the associated images are important documentation of species occurring in the Park. Image collection and databases are being developed for both of these collections.

Aerial Photo Collection

One of the most important historical collections housed by the Park is our collection of aerial photographs. Our current collection includes hard copies of aerial photos and a large number of electronic images taken from planes and satellites. Aerial photographs are being scanned for safe keeping, cataloguing, quick reference and comparison. These images tend to be large, high resolution files and require more special handling and storage procedures than photographs of wetlands and animals.

Cultural and Historical Photo Collection (Cultural Collection)

The natural resources library is one of the only physical structures on Cape Cod National Seashore where hard copies of old maps and historic photographs can be housed. Some of these maps and photographs have been scanned and the images stored on our local server. The natural resource staff also takes photographs during their excursions many of which may be of public interest in the future. Some of these images are simply scenic in nature but provide a good record of the beautiful natural resources in the Park. The content of the images in the cultural collection vary widely. As the collection grows it will be catalogued and organized more fully so that Park Staff has the option of placing some of these images in locations more easily accessible to the public like the Cape Code National Seashore website and NPSFocus.

Natural Resources Images at Other Public Sites (Public Collection)

There are many public websites and libraries being developed within the National Park Service to house and distribute images for public enjoyment as well as natural resource inventory and monitoring data. The Cape Cod Natural Resources Division has created a collection which mirrors the collections held on public sites. These sites include the Cape Cod National Seashore public site, the Northeast Coastal Barrier Network site, the Inventory and Monitoring Information Clearing House and the NPFocus National Image Repository. Naming conventions and metadata requirements for this collection is necessarily higher than for other collections.

Special Collections

The National Parks are often the beneficiary of donated materials. National Parks may also acquire images from expeditions or privately funded projects. These images will be stored in separate logical collections and in the same folders on our network server. The ownership and copyrights for these special collections requires added attention and care that will be defined for each collection.

Natural Resources Collection

These photos are images that have been edited, documented, and added to the Park's digital photo library. The photos are in the public domain but are not currently associated with any national program. These images are believed to have potential value and are being retained indefinitely for future use by Park staff and the public.

Working Photos

The Natural Resources Division Staff collect many hundreds of photos during their field work. These photos must be downloaded from cameras or from remote servers before being edited and documented. Many images will be discarded. A working directory has been created where staff can temporarily house images requiring further processing and review. Metadata for working photos will be added before the images are moved to more permanent file storage. The working file library may also be useful as a location where large resolution originals can be annotated and stored before being archived on CD or DVD

VI. Image File Structure and Storage on the CACO Server

Cape Cod Natural Resources is currently storing all image files (excluding some GIS files) on the local server in an images folder at the top level of the server file structure. Collections for species vouchers, historical and cultural, aerial photos, wildlife, vegetation and inventory and monitoring have separate folders directly under the images directory. The remainders of the images are in folders that have meaning to staff at the Natural Resources Division. These folders will be further subdivided and changed at the request of staff. The file structure will become more formal over time as our file organization improves. Directories for special collections and public photos will be created as needed. All of the image files will be stored in the main images folder with the exception of aerial images and some GIS files. These will be stored in a separate GIS Imagery folder on the server. Image management software allows virtual collections to exist separately from the file organization on a departmental server. The GIS images will be linked logically to the other image libraries for viewing and managing metadata.

Many important images are currently stored in CD libraries. Many of these are still not appropriately documented. We also have important hard copy documents and photographs that need to be scanned and stored in electronic form. Some budget has been allocated to begin scanning and cataloguing these in the near future. The image library system is new to the Park and it will take some time before all of the materials are documented and indexed.

The current server configuration is given in figure 1. (TBD After Review by Staff)

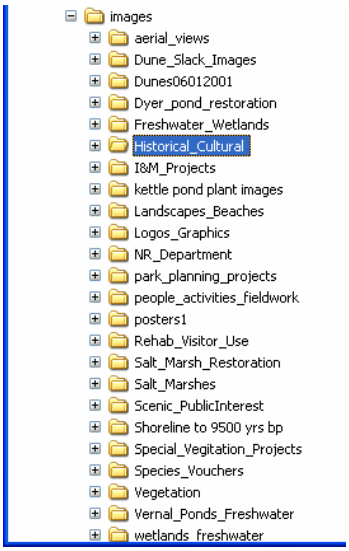

Figure 1. Top Level Image File Structure

VII. Image, Camera and Scanning Specifications

General Specifications

Imaging technology changes very rapidly and standards for file storage may never evolve to the point where they are completely stable. The Library of Congress and other archival institutions like the American Society of Archivists have issued some guidelines but even these are vague. The National Park Service has an archival initiative for imaging centering on a web-based software product called NPSfocus. There is a range of non-proprietary and proprietary image file formats available. The table below taken from the NINCH Guide to Good Practice in the Digital Representation and Management of Cultural Heritage Materials includes some of the more common formats for images.

Table 1: Common Image Files and their Descriptions (From the NINCH Guide)

Extension	Meaning	Description	Strengths/weaknesses
.tiff, .tif	TIFF (Tagged Image File Format)	Uncompressed file. Originally developed for desktop publishing. 1 to 64 bit depth. Used mostly for high quality imaging and archiving.	Generally non-compressed, high quality. Large file sizes. Most TIFF readers only read a maximum of 24-bit color. Delivery over web is hampered by file sizes. LZW compression should not be used for archival masters.
.gif	GIF (Graphics Interchange Format)	This 8-bit file format has support for LZW compression, interlacing and transparency.	Lossless compression. Popular delivery format on web. .png was defined to replace GIF.
.jpg, .jpeg	JPEG (Joint Photographic Experts Group)	Compressed images. 8-24 bit. Variable amount of compression to vary quality and file size.	Lossy compression. Widely used delivery format. Flexible.
MrSid	Multiresolution Seamless Image Database	image-compression technology	Lossy compression. Can compress pictures at higher ratios than JPEG; stores multiple resolutions of images in a single file.
.pcd	ImagePac, PhotoCD	Lossy compression. 24 bit depth. Has 5 layered image resolutions.	Used mainly for delivery of high quality images on CD.
.pdf	Portable Doc. Format	Used mainly to image documents for delivery.	Need plug-in or adobe application to view.

Specifications for Data, Species Vouchers and Cultural Image Files

Images that are part of a data set or that are considered significant should be stored at a fairly high electronic resolution. Uncompressed tiff format at 600 dpi seems to be the prevailing standard for most archival institutions. The file size for images at this resolution can become quite high so lower resolution copies should be made whenever possible. Original or edited files with 600 dpi resolution should be copied onto CD or DVD unless they are referenced frequently. Species vouchers and other hard to replace images should be stored in CD format in two physical locations.

Guidelines for Digital Photographic Images

Digital cameras should be set to 600 dpi or to the highest resolution for the camera. In general, digital cameras with less than 5 mega pixels of resolution are not recommended for photos that will be part of any Natural Resources data set. If a 600 dpi setting is not offered on the camera, resolution should be set at 1760 x 1168 pixels or higher. The quality should be set for "super fine" or "high".

Most digital cameras can digitally imprint the date and time onto the photo image. This detracts from the image quality and should not be used. Date and time data are embedded in jpg and tiff file headers by most digital cameras. The digital headers (EXIF, IPTC data) should be used whenever possible. Accurate camera date and time is important to maintain since this is often the best link with an image and GPS information. Cameras and GIS equipment should be calibrated frequently.

Large files downloaded from cameras should be compressed to no more than 600 dpi to save space. The 600 dpi files can be copied into lower resolution reference copies. Files that are for use in publications usually require no more than 300 dpi resolution. Most Park Service printers print with a resolution of approximately 165 dpi. Computer screens in use at the Park have only about 96 dpi resolution. Files that do not require significant amounts of resolution, like a vegetation plot photo linked to a database will be much smaller and faster to load if the file size is relatively small. The end use and relative importance of digital image files should be considered before storing and archiving most photos.

The NPSfocus website has provided some guidelines on image quality and digital camera capacity that may be useful when determining file sizes to store if the high resolution 600 dpi high resolution format is not required. Copies of files may be reformatted to jpg format to save space and increase loading time when high resolution is not required. Some information on camera specifications and printed images is presented in Table 2 (Amir Khan, NPSFocus April 2004).

Table 2. Digital camera capability and Effective Resolution

Megapixels	Resolution	Approx. print size (300dpi)	Approx. print size (150dpi)
3 MP	2048x1536	5x7"	10x14"
4 MP	2400x1600	6x8"	12x16"
5 MP	2560x1920	6.5x8.5"	13x17"
6 MP	3000x2000	7x10"	14x20"
8 MP	3264x2448	8x11"	16x22"

GIS and NPSFocus Image Format Specifications

The National Park Service NPSFocus archival standard format will be MrSID because of its ability to serve large high resolution files often required by GIS applications. The Library of Congress is also using this format for maps. Many GIS files created with the ArcGIS suite of software programs use this file format as well. Conversion and image file submission guidelines will be issued some time in 2005.

Aerial Digital Photo Specifications

Aerial photos are very high resolution images. These images are usually taken by a contractor so specifications for these images will be on a case by case basis. However, the large file size of these images may require that they be stored on DVD. Reduced resolution copies at 300-600 dpi are recommended for reference storage on the server. Scanned images of existing aerial photos may be taken from the original prints and stored in the photo archives. Specifications for scanning are discussed in the next section.

Scanning Specifications

The resolution of scanned files is selected based on the size of the original. The smaller the photo, slide, or other material, the higher the resolution that should be used to acquire a detailed scan. Recommended standards for scanning images are given on the NPSFocus website. These specifications are reprinted below and are the minimum recommended scan resolutions for different originals. Higher resolution scans will yield larger and better quality images. Since these standards may change, it is recommended that you check with that site before starting any large scanning efforts or contracts.

- **35mm color slide or negative**
  (scanner should be set up to scan transparent materials)
  - Choose source size of approx. 1.3 x .85 inches
    (Software should auto-detect the exact dimensions)
  - Choose target size same as original o Choose resolution 2400 dpi, 24 bit color
    (Do NOT use 32 or 48 bit color)
  - Save as uncompressed TIF file
  - scan to yield file size approximately
    Yields file size ~3120 x 2040 pixels, file size 15-20MB
- **3 1/2" x 5" color photograph**
  - Choose source size 3.5 inch x 5.0 inch
    (Software should auto-detect the exact size)
  - Choose target size the same as the original
  - For color photo, choose resolution 600-700 dpi, 24 bit color
    (Do NOT use 32 or 48 bit color)
  - For black & white photo, choose resolution 600-700 dpi, 8 bit grayscale
    (Do NOT use 16 bit grayscale)
  - Save as uncompressed TIF file
  - Scan to yield file size approximately
    Yields file size approximately 3000 x 2100 pixels, file size 15-20MB
- **4" x 6" color OR black & white photograph**
  - Choose source size 4.0 inch x 6.0 inch
    (Software should auto-detect the exact size)
  - Choose target size the same as the original
  - For color photo, choose resolution 600 dpi, 24 bit color
    (Do NOT use 32 or 48 bit color)

- For black & white photo, choose resolution 600 dpi, 8 bit grayscale (Do NOT use 16bit grayscale)
- Save as uncompressed TIF file
- Scan to yield file size approximately Yields file size approximately 3600 x 2400 pixels, file size 15-20MB

- **5" x 7" color OR black & white photograph**
  - Choose source size 5.0 inch x 7.0 inch (Software should auto-detect the exact size)
  - Choose target size the same as the original
  - For color photo, choose resolution 600 (450 if controls allow it) dpi,
  - 24 bit color (do NOT use 32 or 48 bit color)
  - For black & white photo, choose resolution 600 (450 if controls allow it) dpi, 8 bit grayscale (do NOT use 16bit grayscale)
  - Save as uncompressed TIF file
  - scan to yield file size approximately: yields file size approximately 4200 x 3000 pixels, file size 20-25MB for color
- **8" x 10" color OR black & white photograph**
  - Choose source size 8.0 inch x 10.0 inch (Software should auto detect the exact size)
  - Choose target size the same as the original
  - For color photo, choose resolution 300 dpi, 24 bit color
  - (Do NOT use 32 or 48 bit color)
  - For black & white photo, choose resolution 300 dpi, 8 bit grayscale (Do NOT use 16bit grayscale)
  - Save as uncompressed TIF file
  - Scan to yield file size approximately Yields file size approximately 4200 x 3000 pixels, file size 20-25MB for color
- **8 1/2" x 11" typewritten/printed paper**
  - Scan at resolution 300 dpi or 400 dpi if the text has very small print
  - Save as uncompressed TIF file
  - 9" x 9" aerial photograph
  - If possible scan from diapositive transparencies rather than prints
  - Scan at resolution 1200 dpi or as high as possible/feasible
  - Scan with sharpness set to extreme
  - Save as uncompressed TIF file

VIII. Image Naming Standards

Whenever possible, images must be given very specific file names that will continue to uniquely identify them for the coming decades. However, the large number of files that we maintain makes this impractical in all situations. Unique, logical file naming conventions require a combination of file names, folder names and descriptive qualifiers to be practical. Some descriptive information may be embedded in the image file. Other descriptive metadata will reside in an image database. Cape Cod National Seashore has chosen to use the ThumbsPlus™ software to maintain metadata about each image and manage the image file structure on our server.

Digital cameras automatically assign names to images as they are recorded. The most useful setting for file naming in image files is one that contains a date and sequence number. Cameras that have the capability to add more information to file names should be used whenever possible. However, most digital images will have to be renamed as they are

unloaded from the cameras. Specifications for naming these files vary with the collection to which they belong. Keep the file names as short as possible and avoid using spaces. The underscore character should be used instead. Some more specific guidelines for each collection are given below.

Naming Standards for Files in the General Natural Resources Collections

These files are of unknown value and are not part of any data set or previously identified collection. There are no contractual standards for these images. The images are reserved for staff use with no restrictions. The file names should be as descriptive as possible without being too long. For example, instead of Northern_Harrier.tiff, the file could be named N_Harrier_Nesting.tiff to indicate the action in the photos as well as the subject. The date does not need to be included in the file name but should be included in the embedded date field in the image as well as the ThumbsPlus date field. The Park Code does not need to be included in the file names.

Naming Standards for Wildlife and Vegetation Including Species Vouchers

TBD

Naming Standards for Inventory and Monitoring Photos

File names should assist in the linking of the projects data and the photograph. These files may also have to be submitted to NPSFocus so those guidelines may be used as an alternative scheme for naming the files. The naming conventions used are important in maintaining control of the files and should be determined at the start of every project. Alternate naming conventions should be documented in the project or protocol data management plan if they deviate from these guidelines. The image file name should consist of four parts:

1. The park code
3. Project code (and image description)
2. The date of the image written as YYYY(MMDD optional)
4. Photo number ID

Additional Descriptive words can be added but file names over 20 characters may not be acceptable in the NPS Archives. Renaming files later is not recommended. A code or ID to indicate if the file has been edited may also be desirable. Underscores are recommended, however images that may be posted to the NPSFocus Site should follow those conventions.

Examples:
CACO_SET_Sites_2004_1.tiff
CACO_SET_Sites_2004_2.tiff
CACO_Plover_2004_37.jpg
CACO-Amph-2003_24.jpg

Naming Standards for Public files and NPSFocus Files

Images being stored or viewed on public sites require more strict attention to be paid to individual image names. It is also important to be able to link the image to the Park. The image file name should consist of three or four parts:

1. The park code (e.g. SWAN, ANIA, CACO)
2. A brief description of the image
3. The date of the image written as YYYYMM
4. A numeric extender for multi-part and multi-page items

Each of the first three parts is separated by a hyphen and the forth part by an underscore. Multi-part and multi-page items consist of:

1. Multiple images associated with one record (such as multiple angels of the same windmill). Image numbers can be part of the description if preceded by an underscore.
2. Multiple pages of an item that has been scanned. Note that all sections of the file name have been separated by a hyphen. When an item being digitized consists of multiple parts, the main filename should be followed by an underscore and part number beginning with _1, _2, _3, etc.

Examples:
CACO-HHarbor-Restoration-2001.jpg
CACO-Phragmites-2001_1.jpg
CACO-Phragmites-2001_2.jpg

Special Collections

Some photos are part of unique collections, such as photos from a famous Photographer, an historic expedition, or a well known artist or cartographer. Image Naming standards for these collections will vary with the collection. In general, file names should consist of the Park Code, Year, Collection Name and Sequence Number. It is important to link copyright information

Examples:
CACO_1920_Marconi_14.tif
ANIA_1930_ HubbardB_0001.jpg

Aerial Photos Naming Standards

Many of the Aerial Photos that we currently maintain have image files names that do not conform to any standard. These images can be renamed or retained as is at the option of the Department's staff. Images captured in the future should include the following fields in the filename:

Oblique Handheld Images

1. The word "aerial"
2. Date in YYYYNNDD format
3. The photographer or project identifier
4. A short description (optional)
5. A sequence number

Scanned Aerials from the Printed Collection

1. The word "aerial"
2. Date in YYYYNNDD format
3. The photographer or project identifier
4. A short description (optional)
5. A sequence number

IX. Processing and Editing

NPS Staff take hundreds of images each field season. These photos must be unloaded from their cameras or other imaging acquisition equipment like scanners. The large volume of these photos requires some consistent rules for downloading, naming, editing and documenting the images. After the images have been acquired, either by digital camera or scanning, the general procedures for processing photos are as follows:

A. Establish a file organization for image file within the main images directory
B. Rename the photos.
C. Consider creating low resolution copies for storage on the server and publication.
D. View, delete or edit the files.
E. Document the image files using photo management software.
F. Link the files to their associated I&M databases if required.
G. Prepare images and documentation for on-line long-term storage or off-line archiving.

A. Organization and File Structure for Editing

Raw, unaltered photos should be preserved. The folders containing original, unedited photos should be clearly indicated. Raw photo folders may include multiple photos of the same subject, blurry pictures, or other less desirable photos. This original set of photos should be preserved as is. Copies of raw photos should be saved in clearly named folders for review and editing. For example:

/Subject_A
/Originals – raw, downloaded photos, including poor photos and scanned images.
/Edited –photos which have been renamed, edited or compressed.

Where many different files may be mixed on a camera, the original files may be temporarily copied to an editing directory. Un-needed files can be culled out and files renamed before moving them to a more permanent directory.

After downloading or moving images files to the /Originals directory, this directory should be set to "read-only" permissions to prevent inadvertent edits.

B. Renaming Photos and Scanned Image Files

CACO has purchased image management software to help rename image files. For safety, it is recommended that "Originals" and "Edited" folders be established each time files are copied into the images directories. Copies if the originals in the edited folders should be re-named first so that the old file names can be reclaimed if required. Images can be renamed in a batch process using ThumbsPlus. Refer to the CACO Thumbsplus Users Guide for more information.

C. Creating Low Resolution Copies

Image files are taking up lots of memory and their storage requirements are growing. High resolution image files can be copied to hard storage media like DVD for long term storage. Most image files 165-300 dpi will load much faster and will not appear differently on screen or in a document. Low resolution copies of image files can be made from the originals easily using CACO's image management software. Refer to the CACO Thumbsplus Users Guide for more information.

D. Viewing, Deleting or Editing the Files

ThumbsPlus will allow you to view and edit image files. Un-needed files can be discarded. Along with compressing files, Thumbsplus and other programs allow you to alter the images, correct defects and embed watermarks. The CACO Thumbsplus Users Guide and the help files for the program have more information on the mechanics of editing. Edited files should have names that closely link to the original files but have a different ID or code number to indicate that they are edited versions of the originals. The Thumbsplus editor should provide all of the functionality required for our operations. If more complete editing is required, other software can be used. However, some software overwrites or looses the embedded metadata in the EXIF or IPTC fields of the image files. Any editing procedure outside of Thumbsplus should be carefully investigated before use.

X. Background on Image Metadata Standards Adopted by CACO

Image metadata standards are still under development for the National Park Service. Even after image metadata standards are established we may have to provide additional information about each image in formats that are particular to a given clearinghouse or storage facility. CACO has combined metadata standards being proposed by the Southwest Alaska Network and the NPSfocus clearing house. The NPSFocus metadata fields are consistent with the Dublin Core metadata fields.

The Dublin Core Metadata Initiative is an open forum engaged in the development of interoperable online metadata standards that support a broad range of purposes and

business models (Dublin Core). Dublin Core metadata provides card catalog-like definitions for defining the properties of objects for Web-based resource discovery systems. The Dublin Core is a descriptive metadata extension to the Metadata Encoding and Transmission Standard (METS). The METS schema is a standard for encoding descriptive, administrative, and structural metadata regarding objects within a digital library expressed using the XML schema language of the World Wide Web Consortium. The standard is maintained in the Network Development and MARC Standards Office of the Library of Congress, and is being developed as an initiative of the Digital Library Federation.

CACO has tried to create image metadata fields that are as close as possible to the Dublin Core and NPSFocus Metadata Descriptors. All CACO descriptors can be translated into Dublin Core or NPSFocus standards through simple queries of the image management database. Table 2 contains definitions and cross references between CACO metadata elements and the metadata elements required for NPSFocus. It was created from the NPSFocus Metadata Elements Page of the NPSFocus Website. This standard is under development and should be checked frequently for updates. Images used as species vouchers (i.e. the primary documentation of species occurrence) should have as a minimum Scientific Names in the metadata, and the preferred ITIS TSN. Images that are the actual vouchers will also be required to include the voucher catalogue ID in its file name and the CACO image database.

The CACO image management database implements the metadata fields as "User" defined fields in a Microsoft Access database linked to Thumbsplus. This database can be opened and manipulated in Access independently. Default values are being set wherever possible. Queries to translate metadata fields between standards and export the information are under development. The table and field definitions for the CACO image management database are given in the CACO Image Database Data Dictionary in Appendix A.

Keywords for CACO will be defined in advance of the field season. An approved list of keywords will be maintained to prevent proliferation of keywords and to maintain some consistency with NPS Thesaurus Keywords.

Table 2 NPS Focus and CACO Image File Metadata Elements
(Based on Dublin Core-Qualified Metadata Standard)

NPS Element	CACO Element	Dublin Core Equivalent	Required/Optional	Definition
Abstract	Description	DC.Description.abstract	Required	Abstract or summary of content and significance of resource. In most cases this will be a description.
Author/Contributor *Subelements:* Role Affiliation	Photographer	DC.Contributor	Required	Person(s) or agencies responsible for resource in its current form, eg. author, photographer, sponsor; any name associated with resource. Use *Role* to indicate person's or agency's responsibility
Contents	N/A	DC.Description.contents	Required *if multiple images described on the same record*	Brief title/description of each of multiple images or Table of Contents from text
Coverage, Place *Subelements:* North [coordinate] West [coordinate]	Place UTMX UTMY Datum	DC.Coverage.spatial	Required	Geographic area covered by resource, eg. State - county/city – Park. This defaults to Cape Cod National Seashore.
Coverage, Time *Subelements:* BeginDate EndDate	Date Taken	DC.Coverage.temporal	Required	Time period covered by resource. For image files this is usually the day the image was created. No end date is required. Format is YYYYMMDD.
Date Created *Subelements:* Text,yyyymmdd	Date Created	DC.Date.created	Required	Date made available in its current form. YYYYMMDD. Defaults to the date taken.
DjVu *Subelements:* Server, Catalog File	TBD	-	Optional	Elements used to create the link to texts & drawings on the Image Server. Not used at this time at CACO.
Format & size	N/A	DC.Format	Required	quantity [of pages, images, etc.], Electronic or physical format, size (of file or physical dimensions)
Is Part of	Collection Name	DC.Relation.isPartOf	Required	Name of larger Collection, series.
Keywords	Keywords	DC.Subject	Required *Use either Keywords OR Subject OR Both*	Subject term(s) not from a thesaurus

Table 2 NPS Focus and CACO Image File Metadata Elements (Continued)

NPS Element	CACO Element	Dublin Core Equivalent	Required/Optional	Definition
Location	Storage Location	-	Optional	Place physical items are stored, from park name to storage cabinet
MrSID *Subelements:* Server Catalog File	N/A	-	Optional	Elements used to create the link to pictorial images on the Image Server
Note	N/A (See Abstract)	DC.Description	Optional	Any free text description/information about the resource
Park Code	Park Code	-	Required	Park code as listed in the NPS Thesaurus
Park Name	Park Name	-	Required	Form of name give in NPS Thesaurus
Publisher	Publisher	DC.Publisher	Required	Agency that caused the item to be produced in its current form; usually National Park Service
Resource Type	Resource Type	DC.Type	Required	Choose: Image, Text, Video, Web page (or other item on list). Defaults to Image.
Rights/Access	Rights	DC.Rights	Required	Restricted access or Publicly Available
Source/Original	Source	DC.Source	Required *IF resource has been digitized or altered*</< font>	Description of original source before it was scanned, encoded or otherwise altered
Standard Number	Identifier	DC.Identifier	Optional	Any standard no. or accession number associated with resource. May be a voucher catalogue ID.
Subject *Subelement:* Thesaurus	(See Keywords)	DC.Subject	Required *Use either Keywords OR Subject OR Both*	Subject term from a thesaurus
Title	Title	DC.Title	Required	Title of title page or cover, very descriptive made up title for images; omit initial articles. May be a caption. This field will be set to the description if left blank.

XI. Cataloging and Documenting Images

Some information associated with the images is inherent in the file structure. Inventory and monitoring folders contain information on the program, folder content and year. However, image files will require additional bibliographic information which will vary based the project requirements. Image files will also be much more useful and accessible if descriptive keywords are associated with the files. CACO will use an Access database managed by ThumbsPlus software to add keywords, copyright information, descriptions and other metadata for each image. Table 3 summarizes the minimum metadata elements have been adopted until a standard is issued. Items in gray are included as needed or have default values.

Table 3. Minimum Documentation Requirements for Image Files

Element	Data Entry Notes
Description	This is a required field. May include TSN numbers.
Collection Name	Defaults to I&M or other database default. Use "NR" for general images.
Keywords	Keyword set defined by CACO staff. See CACO image guidelines.
File name	Automatically stored in Thumbsplus.
Date Taken	Any access format date or time.
Project Code	The project code or other CACO internal code. Required for I&M, restoration and other funded projects.
Place	Area, site or place. This is the same as the site name in I&M databases.
Photographer	Defaults to NPS. Can be the name of an institution or person.
Publisher	Defaults to NPS.
Park Code	Defaults to CACO.
Storage Location	Required only if the original is in another location
Resource Type	Defaults to "Image". Could be text or video.
Rights	Usually Public Domain for NPS Photos and Graphics.

Images that will be sent to other locations for long term storage or access by the public may require more detailed metadata records. The following fields will be used until national standards are adopted.

Table 4. Full Metadata Record Requirements for Image Files

Element	Data Entry Notes
Description	A short description. Include TSN numbers or other relevant codes.
Collection Name	Defaults to name of the collection, usually I&M. General Natural Resources photos do not require a collection name. Aerial Photos and other images stored in separate databases will have their own defaults.
Keywords	Keyword set defined by CACO staff. See CACO image guidelines.
File name	Automatically stored in Thumbsplus.
Date Taken	Any access format date or time.
Project Code	The project code or other CACO internal code. Required for I&M, restoration and other funded projects.
Place	Area, site or place. This is the same as the site name in I&M databases.

Table 4. Full Metadata Record Requirements for Image Files (Continued)

Element	Data Entry Notes
Photographer	Defaults to NPS. Can be the name of an institution or person.
Publisher	Defaults to NPS.
Park Code	Defaults to CACO.
Location	A plot location or specific location within a "Place".
Identifier	An image sequence number, catalogue ID or other special code.
UTMX	GPS indictor. Included whenever practical.
UTMY	GPS indictor. Included whenever practical.
Datum	Defaults to XXXXX
Source	Optional reference to an original.
Storage Location	Required only if the original is in another location
Resource Type	Defaults to "Image". Could be text or video.
Rights	Usually Public Domain for NPS Photos and Graphics.
File location	Automatically stored in Thumbsplus
Title	Short title required for NPSFocus. May be the same as the description
Comments	An unused field used for your own notes or comments

Digital photo files embed some metadata and will hold this information in an **EXIF file that stays with the photograph until the photograph is modified**. These include photograph related items like File name, Aperture, Date Digitized, Date Taken, Exposure Time, F-Number, Flash (yes, no), Focal Length, ISO Speed, etc.

Additional File Attributes may include (IPTC standards) subject distance, city, state, country, equipment make, equipment model, etc.

Photos that are part of an I&M data set may be linked directly to the monitoring databases. In these instances, the monitoring event and image file are linked. These images still need to be documented in the CACO (Thumbsplus) database.

XII Long-term Storage and Archiving

Once the photos have been processed, original photos should be archived onto a CD-ROM or DVD and labeled as originals. This temporary archiving should occur at least once per filed season and is the responsibility of each staff member. Photos and image files on the server will be backed up at least two times per week as part of the normal tape backup for the departmental server. Users should try to limit storage of large files on the server, however, and should use CDs or DVDs backup whenever possible. ThumbsPlus has the capability to create contact sheets from directories. These can be useful for quick reference when storing DVD's or CD's.

Annual Archiving

CACO will archive all of the image collections at the end of each calendar year for semi permanent storage. The metadata database and image files will be archived together on DVD's at the end of each year. A tape copy of the images directory will be made that will be

held for at least one year before being overwritten. The DVD and Tape libraries will be stored off-site. Additional copies of DVD's may be stored in the Natural Resources Library for reference. The DVD's will be retained for an indefinite period of time.

Permanent Archiving

Special Collections and projects that are no longer active will be archived on DVD. Files that are part of the I&M programs and Special Natural Resources Collections will remain on the server in addition to be placed on DVD. More permanent copied of the images will be made at appropriate milestones in Park programs or projects. Contact sheets will be made for images not already created during annual archiving. DVD's and contact sheets for our permanent copies will be stored in the Wellfleet Headquarters. Important data sets will be replicated on national level information clearing houses for redundant storage. Bibliographic information on these collections will be entered into national bibliographies as appropriate.

NPS Focus Digital Image Library

The NPS Focus Digital Library consists of a seamless integration of a metadata management system and a separate image management system. It represents the first NPS effort to maintain a central repository for pictorial and textual digital content as well as a coordinated effort to set up policies and procedures for scanning, serving, and archiving digital resources. The system is designed to support all interested NPS endeavors. NPS Focus is a library or repository of images. It is not a multimedia application. NPS Staff and the public will use NPS Focus to search for relevant images and then link to them or download images from the library to build into a web page, PowerPoint presentation, or other application (Evans 2003).

Images and files for the I&M program may be submitted to this website in the near future. Special images of interest to the public may also be stored there. Copies of the files submitted to the NPS focus should be archived on DVD to maintain of record of files that have been sent to that site and provide a record of the files that have been sent to public sites. A text file or database file containing all of the metadata for those records should be stored with the images on DVD.

XIII. Photograph Property and Use

(From the Southwestern Alaska Image Management Plan)

All photos collected with the National Park Service funds and staff time are property of NPS. Contractors using photographs as part of their project should provide copies, preferably high resolution digital copies, to the NPS project manager. When using a photograph, provide credit to the photographer. This is usually written on the right side of the photograph or at the bottom in a smaller font size (san serif) than the text in the document.

IX. Photos of People and Rights to Privacy

(From the Southwestern Alaska Image Management Plan)

When taking a photo of a person, the subject's right to privacy must be considered. Photographers taking images with the following subjects should seek a model waiver form:
- A recognizable person, AND
- The person is not a government employee (on-duty), AND
- The photo will be used for profit to the photographer, OR
- Any photos of a minor, where the minor is recognizable.

Photos meeting the following criteria do not need a model waiver form:
- Photos are in the public domain (unless protected by law)
- Photos are not for profit
- If photos are used for profit, such as in a magazine, it is not NPS who profits

In the case of NPS, it is rarely the case where a model waiver form is needed. Typically these photos are used for education and editorial purposes, where photos of subjects are acceptable.

Other violations of privacy may include:
- The photographer intruded on the person's seclusion to take the photo
- Private information about the person is now made public
- When the photo causes the average, reasonable person to believe something about them that isn't true. These instances should not occur within the scope of government work.

NPS and contracting photographers should exercise the following guidelines when photographing people:
- Generally avoid photos of minors for public distribution.
- Intentionally do not identify the non-government people pictured, providing one less invasion of privacy.

VII. Acknowledgements and Future Work

All of the Parks and Networks will be spending a great deal of effort managing our growing collections of image files. Dorothy Mortenson and Bill Eichenlaub have been exceptionally generous in providing examples of image management techniques and policy documents. I have referred to their documents throughout. Kass Evans, Stacey Provencal and Mark Sappington provided technical input and experience in managing digital image files. Angie Southwould, Alan Williams and Bill Eichenlaub all provided code examples and great tips for linking image files to I&M databases. Other contributors include Deborah Angell, Margaret Beer, Richard Easterbrook, Joe Gregson, Wendy Schumacher and Mark Wotowa.

There are many people working on image management practice at the Park Service. I would like to see the good communication, cooperation, and progress continue. Please feel free to use any of the ideas and text in this document when you write your own photo management plan. Text that I have indicated as coming from other documents (Alaska, NPSFocus) should retain the references to the original material. If you use material from this document I request that you post copies of your plans so that we can all improve and save

time. Editorial comments on this document and suggestions on how we may improve our image management practices at CACO are greatly appreciated.

VIII. References

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